

WHAT IS CLAIMED IS:

- 1 *Sub 17* 1. An impairment compensation sequence for use in a communications
 2 system, the communications system susceptible to one or more potential impairments
 3 each periodic in an integer number of symbols transmitted across a communications
 4 channel, the impairment compensation sequence comprising:
 5 N phases, wherein N is selected such that each potential impairment, if
 6 present, is periodic therein; and
 7 a sequence of symbols, the sequence organized to place at least one instance of
 8 each symbol from a predetermined set of symbols in each phase to
 9 allow detection of the potential impairments in each of the N phases.
- 1 2. The impairment compensation sequence of claim 1 wherein the potential
 2 impairments include at least one of robbed-bit signaling, padding and a combination
 3 of robbed-bit signaling and padding.
- 1 3. The impairment compensation sequence of claim 1 wherein the sequence
 2 includes a number of segments, the number corresponding to a number of elements in
 3 the predetermined set of symbols.
- 1 4. The impairment compensation sequence of claim 1 wherein the
 2 predetermined set of symbols are chosen from at least a subset of a universal pulse
 3 code modulation (PCM) codeword set.
- 1 5. The impairment compensation sequence of claim 4 wherein the subset is
 2 selected in accordance with power constraints.
- 1 6. The impairment compensation sequence of claim 1 wherein the N phases
 2 include 24 time phases.
- 1 7. The impairment compensation sequence of claim 1 wherein N is a least
 2 common multiple of respective periods of each of the potential impairments.

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1 8. The impairment compensation sequence of claim 1 wherein the sequence is
2 organized to place at least two instances of the symbol from the predetermined set of
3 symbols in each phase, an average of received values corresponding to the at least two
4 improving an estimation of the symbol.

1 9. The impairment compensation sequence of claim 1 wherein the sequence
2 includes a plurality of segments each corresponding to respective symbols of the
3 predetermined set thereof, each segment having a portion therein repeated at least
4 once, each segment providing at least two instances of one of a positive reference
5 symbol, a negative reference symbol, a positive training symbol, and a negative
6 training symbol.

1 10. A communication system susceptible to one or more potential
2 impairments each periodic in an integer number of symbols transmitted across a
3 communications channel, the communication system comprising:
4 a receiver to receive an impairment compensation sequence, the impairment
5 compensation sequence including:
6 N phases, wherein N is selected such that each potential impairment, if
7 present, is periodic therein; and
8 a sequence of symbols, the sequence organized to place at least one
9 instance of each symbol from a predetermined set of symbols in
10 each phase to allow detection of the potential impairments in
11 each of the N phases; and
12 an equalizer to equalize the impairment compensation sequence, the equalizer
13 producing amplitude estimates of the sequence of symbols.

1 11. The communications system of claim 10 wherein the sequence includes a
2 number of segments, the number corresponding to a number of elements in the
3 predetermined set of symbols.

1 12. The communications system of claim 10 wherein the potential
2 impairments include at least one of robbed-bit signaling, padding and a combination
3 of robbed-bit signaling and padding.

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1 13. The communications system of claim 10 wherein the predetermined set of
2 symbols includes at least a subset of a universal pulse code modulation (PCM)
3 codeword set.

1 14. The communications system of claim 10 wherein the N phases include 24
2 time phases.

1 15. The communications system of claim 10 wherein N is a least common
2 multiple of respective periods of each of the potential impairments.

1 16. The communications system of claim 10 wherein the sequence is
2 organized to place at least two instances of the symbol from the predetermined set of
3 symbols in each phase, an average of received values corresponding to the at least two
4 improving an estimation of the symbol.

1 17. A receiver for receiving data over a communications channel susceptible
2 to one or more potential impairments each periodic in an integer number of symbols
3 transmitted across a communications channel, the receiver comprising:
4 a demodulator for demodulating a modulated impairment compensation
5 sequence, the impairment compensation sequence including:
6 N phases, wherein N is selected such that each potential impairment, if
7 present, is periodic therein; and
8 a sequence of amplitudes transmitted from terminal equipment, the
9 sequence organized to place at least one instance of each
10 symbol from a predetermined set of symbols in each phase to
11 allow detection of the potential impairments in each of the N
12 phases; and
13 a decoder for decoding the sequence of amplitudes.

1 18. A method of establishing communication across a channel, the
2 communication susceptible to one or more potential impairments each periodic in an
3 integer number of symbols, the method comprising:

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4 receiving a sequence of symbols, the sequence organized to place at least one
5 instance of each symbol from a predetermined set of symbols in each
6 of N phases, wherein N is selected such that each potential impairment,
7 if present, is periodic therein; and
8 detecting potential impairments, if present, corresponding to each of the N
9 phases.

1 19. The method of claim 18, wherein the channel includes a digital portion of
2 a Public Switched Telecommunications Network (PSTN) and wherein the potential
3 impairments include at least one of robbed-bit signaling (RBS), padding, and a
4 combination of robbed-bit signaling and padding in the digital portion of the PSTN.

1 20. The method recited in claim 18 wherein the sequence of symbols is a
2 digital impairment learning (DIL) sequence.

1 21. The method recited in claim 18 wherein N is a least common multiple of
2 respective periods of each of the potential impairments.

1 22. The method recited in claim 18 wherein the sequence of symbols is
2 organized to place at least two instances of the symbol from the predetermined set of
3 symbols in each phase, an average of received values corresponding to the at least two
4 instances improving an estimation of the symbol.

1 23. The method recited in claim 18 wherein the sequence of symbols includes
2 a number of segments, the number corresponding to a number of elements in the
3 predetermined set of symbols.

1 24. The method recited in claim 18 wherein the predetermined set of symbols
2 are chosen from at least a subset of a universal pulse code modulation (PCM)
3 codeword set.

1 25. The method recited in claim 24 wherein the subset is selected in
2 accordance with power constraints.

1 26. The method recited in claim 18 wherein the sequence of symbols is a
2 digital impairment learning (DIL) sequence.

1 27. The method recited in claim 18 wherein the sequence of symbols is
2 compatible with a plurality of equalizers, the plurality of equalizers including partial
3 response type equalizer structures.

1 28. A computer program product comprising:
2 instructions executable on at least one processor to at least partially implement
3 a communications device; and
4 said instructions including a communication subset thereof executable to adapt
5 the communications device to establish communication across a
6 channel susceptible to one or more potential impairments each periodic
7 in an integer number of symbols transmitted across the channel, the
8 communications device for receiving an impairment compensation
9 sequence, the impairment compensation sequence including:
10 N phases, wherein N is selected such that each potential impairment, if
11 present, is periodic therein; and
12 a sequence of amplitudes transmitted from terminal equipment, the
13 sequence organized to place at least one instance of each
14 symbol from a predetermined set of symbols in each phase to
15 allow detection of the potential impairments in each of the N
16 phases.

1 29. A computer program product as in claim 28 wherein the instructions are
2 encoded by or transmitted in at least one computer readable medium selected from the
3 set of a disk, tape or other magnetic, optical, or electronic storage medium and a
4 network, wireline, wireless or other communications medium.

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